

TITLE OF THE INVENTION

Cap having a chamber for a raw material and sealing mechanism for a vessel

BACKGROUND OF THE INVENTION

1. Technical Field of the invention

This invention relates to a sealing mechanism for a vessel with a cap closure. Such vessels can preserve liquid contents having several raw materials, a refreshing drink for example, in a single vessel by isolating the raw materials from each other until they are mixed when ready to be used. The invention also relates to a cap to be used in the mechanism for raw material.

2. Prior Art

A medicine to be used mixing two agents, a refreshing drink produced by mixing a raw material into a liquid or the like occasionally changes in quality when they have not been used or consumed for a long time after they were mixed, because the mixed agents react or the raw material mixed into the liquid deteriorates under the influence of sunlight or oxygen in the air. Therefore, as a way to preserve these liquids or the like in a condition where original qualities are kept, methods have been proposed to separately preserve raw material and liquid to be mixed by providing a cap for sealing vessel to include the liquid inside with a receiving chamber for the raw material. As examples, there are such means disclosed in Japanese patent publication No H08-91418, Japanese utility model publication No S44-12957, S50-18846, S50-18847, S50-18848 and S50-18844.

However, the means disclosed in above listed documents have several problems to solve. Namely, according to the means, it is difficult to fix a cut-ring to prevent a cap from being opened improperly by a third party in the distribution, they increase cost for vessels, it is difficult to fix them to vessels, or sealing and opening of a receiving chamber is incomplete.

Therefore, to solve these problems the applicant of the present invention

proposed a sealing mechanism for a vessel with a cap closure disclosed in Japanese patent application No 2002-238815.

This sealing mechanism comprises a cap and a vessel having opening portion, and the cap has characteristic structure. Then, the cap has a structure wherein a plug portion having a top wall to cover the vessel fits on an outer circumferential surface of the opening portion by an inner surface of a side wall projecting from the top wall along an axis of itself. Further, in the structure, a receiving chamber is formed by a cylindrical wall projecting from the top wall in the side wall of the plug portion, a seal plug to seal the receiving chamber is separated from the cylindrical wall by a sleeve loosely fitting on the cylindrical wall. In the case of the sleeve, it is prevented from being pulled out from the vessel by a flexible projecting portion having outer diameter larger than inner diameter of the opening portion. Also the projecting portion has flexibility to allow to pass the inner diameter by bending and subsequently resist backward movement. Then, because of its structure, it can be inserted inside the vessel easily but not be pull out from the vessel after insertion. Therefore, according to the sealing mechanism using this cap, to a common vessel to separately preserve the raw material and the liquid to be mixed, a cap to seal the vessel can be fixed easily and directly. Further, because the plug portion to seal the vessel can be screwed directly to the vessel, a cut-ring can be fixed.

However, according to the prior means, including the prior sealing mechanism by the applicant of the present invention, to preserve a raw material or the like by using a cap having a receiving chamber, the opening of the receiving chamber and the seal plug to close it must be highly accurate in their shapes or a slight error causes a gap between them. Then, there is a problem that the cost becomes high to make the receiving chamber enable to seal and preserve the raw material or the like contained in itself for long period.

Therefore, firstly, the present invention aims to provide a cap enables to seal and preserve a raw material or the like contained in a receiving chamber with high reliability at low cost.

Further, according to the prior sealing mechanism by the applicant of the present invention, there is a problem that the structure becomes complex. For example, the flexible projecting portion must be formed on the sleeve required to open the receiving chamber to fix the sleeve on the vessel.

Therefore, secondly, the present invention aims to provide a sealing mechanism, for a vessel to separately preserve the raw material and the liquid to be mixed using a cap with a receiving chamber, which mechanism having a cap with simple structure enables to fix the cap to the vessel easily and also to be equipped with a cut-ring.

SUMMARY OF THE INVENTION

A cap relating to the present invention comprises a plastic plug portion and a plastic seal plug. The plug portion has a top wall to cover an opening portion of a vessel, a side wall projecting from the top wall along an axis of the plug portion, which wall has an inner circumferential surface arranged to fit on an outer circumferential surface of the opening portion, and a cylindrical wall forming a receiving chamber having an opening at its lower end face, which wall projects from said top wall on the inside of said side wall. In the case of the seal plug, it has the outer diameter being larger than outer diameter of the cylindrical wall. Then this cap is characterized in that the seal plug is welded to the lower end face of the cylindrical wall while the receiving chamber is filled with a filling. Here, in the present invention, being weld means that two separate plastic parts are connected by their portions melted by thermal energy, vibrant energy or other energies.

In such a cap, because the receiving chamber is sealed with the seal plug welded to the lower end face of the cylindrical wall, gaps due to slight sizing

errors in shapes of the seal plug and the opening of the receiving chamber are filled up with the melted material of themselves. Therefore, it becomes possible to produce the plug portion or the seal plug without sever caring about accuracy in their shapes, and a raw material or the like contained in a receiving chamber can be sealed and preserved with high reliability at low cost.

Further in this cap, the receiving chamber can be opened by separating the seal plug from the receiving chamber with applying common means and using the outer circumferential portion of the seal plug which portion projecting from the outer circumferential surface of the cylindrical wall. Here, common means is a sleeve, a projecting portion formed on the vessel and so on.

Furthermore in this cap, the plug portion has a structure wherein it is arranged to fit on the outer circumferential surface of the opening portion by the inner circumferential surface of the side wall projecting from the top wall along the axis of itself. Therefore, the plug portion can be screwed directly to the vessel even if it has the receiving chamber, and a cut-ring can be fixed. Here, it is assumed that the inner circumferential surface of the side wall may fit on the outer circumferential surface of the opening portion by being screwed in the most case considering to fix the cut-ring. However, it can fit not only by being screwed but by being engaged with each other or by other way to fix.

A sealing mechanism relating to the present invention is for a plastic vessel which can be closed by a plastic cap and has a plastic sleeve. The vessel has an opening portion and the cap has a plug portion and a seal plug. The plug portion has a top wall to cover an opening portion of a vessel, a side wall projecting from the top wall along an axis of the plug portion, which wall has an inner circumferential surface arranged to fit on an outer circumferential surface of the opening portion, and a cylindrical wall forming a receiving chamber having an opening at its lower end face, which wall projects

from said top wall on the inside of said side wall. The seal plug closes the opening by being fixed to the cylindrical wall being loosely fitted into the sleeve and has an outer circumferential portion projecting from the outer circumferential surface of the cylindrical wall to a position where it comes below the sleeve on the direction along the axis. Then the sleeve is welded to the inner circumferential surface of the opening portion.

In such a sealing mechanism, because the sleeve to separate the seal plug from the receiving chamber is to be welded to the vessel, the sleeve and the inner circumferential surface of the opening portion do not have to be fixed if only contacting each other at a step of inserting the sleeve to the vessel in a manufacturing process. Therefore, it is not needed to equip particular structure to be pressed tightly to or be caught by the inner surface of the opening portion, the shape of the sleeve can be simplified and an insertion to the opening portion can be easily done.

Further, because the sleeve welded to the vessel can be fixed to the vessel more strongly than the one being pressed tightly to or being caught by the inner surface of the opening portion, the seal plug can be separated with more high reliability.

Furthermore, in this sealing mechanism, the plug portion has a structure wherein it is arranged to fit on the outer circumferential surface of the opening portion by the inner circumferential surface of the side wall projecting from the top wall along the axis of itself. Therefore, the plug portion can be screwed directly to the vessel even if it has the receiving chamber, and a cut-ring can be fixed.

In the sealing mechanism relating to the present invention, the cap may be a cap relating to the present invention with the sleeve, and the seal plug may be welded to the lower end face of said cylindrical wall while receiving chamber may be filled with a filling.

In this case, shearing load works on the welding point of the vessel and

the sleeve while pulling load works on the welding point of the seal plug and the cylindrical wall when the sleeve catches the outer circumferential portion of the seal plug and separates it from the receiving chamber. Because bearing ability of a welding point to the shearing load is higher than the pulling load, the welding point of the seal plug and the cylindrical wall breaks firstly. Therefore, the seal plug is smoothly separated from the cylindrical wall whereon it is welded, and the cap relating to the present invention can be preferably used in this sealing mechanism.

The sleeve may have a sharp head portion formed by an lower end face sloping with respect to the axis.

Thus, the seal plug can be separated smoothly because stress is concentrated on specific one portion of it.

The sleeve and the seal plug may be made of same material as of the vessel.

In this way, the vessel can be collected and recycled effectively because it is possible to omit extra work to remove the sleeve and the seal plug from inside of the vessel wherein they are left.

The material of which the vessel, the sleeve, and the seal plug are made may be PET.

In this way, widespread vessels can be used. Further, its function to prevent oxidization of the filling in the receiving chamber can be improved because oxygen permeability of PET is lower than the one of PP (polypropylene) or PE (polyethylene).

The cap may be made of same material as of the vessel.

In this way, the vessel can be collected and recycled effectively because it is possible to omit extra work to remove the cap from the vessel.

The material of which the cap and the vessel are made may be PET.

In this way, widespread vessels can be used. Further, its function to prevent oxidization of the filling in the receiving chamber can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front section shows the cap relating to the present invention and a vessel to be sealed by the cap.

Fig. 2 shows the sealing mechanism relating to the present invention, Fig. 2(a) being a front section of condition before the receiving chamber is opened and Fig. 2(b) being a front section of condition after the receiving chamber is opened.

Fig. 3 shows an embodiment of application of a cap relating to the present invention to a sealing mechanism wherein a common means is used to open the receiving chamber, Fig. 3(a) being a front section of condition before the receiving chamber is opened and Fig. 3(b) being a front section of condition after the receiving chamber is opened.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In Figs. 1 and 2, an embodiment of a cap relating to the present invention and an embodiment of a sealing mechanism for vessel wherein the cap is used are shown.

A cap 1 is to seal a vessel 2 and has a plastic plug portion 4, a plastic seal plug 5 and a plastic sleeve 6.

The plug portion 4 has a top wall to cover an opening portion 3 of the vessel 2, a side wall 12 projecting from the top wall 11 along an axis X of the plug portion 4, which wall has an inner circumferential surface arranged to fit on an outer circumferential surface of the opening portion 3, and a cylindrical wall 15 forming a receiving chamber 14 having an opening 13 at its lower end face, which wall projects from the top wall 11 on the inside of the side wall 12. Further, on bottom side of the top wall 11, a packing 20 is attached. Furthermore, to under edge of the side wall 12, a cut-ring 21 is connected.

The seal plug 5 has the outer diameter D1 being larger than outer diameter

D2 of the cylindrical wall 15 and is welded to the lower end face of the cylindrical wall 15 while the receiving chamber 14 is filled with a filling 16. Here, the seal plug 5 is welded by using ultrasonic waves. However, heating plats, vibrations or high frequency induced heats or the like can be used for the welding.

In this cap 1, because the receiving chamber 14 is sealed with the seal plug 5 welded to the lower end face of the cylindrical wall 15, gaps due to slight sizing errors in shapes of the seal plug 5 and the opening 13 of the receiving chamber 14 are filled up with the melted material of themselves. Therefore, it becomes possible to produce the plug portion 4 or the seal plug 5 without sever caring about accuracy in their shapes, and a raw material or the like (the filling 16) contained in a receiving chamber 14 can be sealed and preserved with high reliability at low cost.

Further in this cap 1, the receiving chamber 14 can be opened 14 by separating the seal plug 5 from the receiving chamber 14 with a sleeve 6 and the outer circumferential portion of the seal plug 5 which portion projecting from the outer circumferential surface of the cylindrical wall 15.

Furthermore in this cap 1, the plug portion 4 has a structure wherein it is arranged to fit on the outer circumferential surface of the opening portion 3 by the inner circumferential surface of the side wall 12 projecting from the top wall 11 along the axis X of itself. Therefore, the plug portion 4 can be screwed directly to the vessel 2 even if it has the receiving chamber 14, and a cut-ring 21 can be fixed.

Next, an embodiment of a sealing mechanism relating to the present invention is described using an example wherein this cap 1 is applied.

A sealing mechanism using this cap 1 has the sleeve 6 as its member in addition to the cap 1 and the vessel 2. Then, the seal plug 5 closes the opening 13 by being fixed to the cylindrical wall 15 being loosely fitted into the sleeve 6. Further, an outer circumferential portion 17 of the seal plug 5

projects from the outer circumferential surface of the cylindrical wall 15 to a position where it comes below the sleeve 6 on the direction along the axis X. In the case of the sleeve 6, it is welded to the inner circumferential surface of the opening portion 3.

The sleeve 6 is welded by using ultrasonic waves, and the annular welding point is formed under an end portion of a spiral passage on the outer circumferential surface. Heating plats, vibrations, high frequency induced heats or the like described above can be used for the welding in this case, too. Further, the position of the welding point is not limited but it can be changed to suit for manufacturing process or other situations.

In this sealing mechanism, because the sleeve 6 to separate the seal plug 5 from the receiving chamber 14 is to be welded to the vessel 2, the sleeve 6 and the inner circumferential surface of the opening portion 3 do not have to be fixed if only contacting each other at a step of inserting the sleeve 6 to the vessel 2 in a manufacturing process. Therefore, it is not needed to equip particular structure to be pressed tightly to or be caught by the inner surface of the opening portion 3, the shape of the sleeve 6 can be simplified and an insertion to the opening portion 3 can be easily done.

Further, because the sleeve 6 welded to the vessel can be fixed to the vessel 2 more strongly than the one being pressed tightly to or being caught by the inner surface of the vessel 2, the seal plug 5 can be separated with more high reliability.

Further in this sealing mechanism, shearing load works on the welding point of the vessel 2 and the sleeve 6 while pulling load works on the welding point of the seal plug 5 and the cylindrical wall 15 when the sleeve 6 catches the outer circumferential portion 17 of the seal plug 5 and separates it from the receiving chamber 14. Because bearing ability of a welding point to the shearing load is higher than the pulling load, the welding point of the seal plug 5 and the cylindrical wall 15 breaks firstly. Therefore, the seal plug

5 is smoothly separate from the cylindrical wall 15 whereon it is welded, and the cap 1 can be preferably used in this sealing mechanism.

The seal plug 5 of the cap 1 can be separated from the receiving chamber by using other common means without using the sleeve 6 of this sealing mechanism. In Fig. 3 an embodiment of a sealing mechanism wherein a common means is used to separate the seal plug 5 from the receiving chamber 14. In the sealing mechanism shown in Fig. 3, an projecting portion 7 is formed at bottom part of the opening portion 3 of the vessel 2. Thus, when the plug portion 4 relatively moves in a direction where it takes off the vessel 2, the circumferential portion of the seal plug 5 is caught by the projecting portion 7 whereby the seal plug 5 is separated from the cylindrical wall 15 to open the opening 13. As shown here, the cap 1 can be opened by any common means. However, it is preferable to use the sleeve 6 welded to the vessel 2 because the seal plug 5 can be smoothly separated from the cylindrical wall 15 where it is welded because of the reason described above.

The sleeve 6 has a sharp head portion 18 formed by an lower end face sloping with respect to the axis X.

In this case, the seal plug 5 can be separated smoothly because stress is concentrated on specific one portion of it.

The sleeve 6 and the seal plug 5 are made of same material as of the vessel 2.

In this case, the vessel 2 can be collected and recycled effectively because it is possible to omit extra work to remove the sleeve 6 and the seal plug 5 from inside of the vessel 2 wherein they are left.

Further, the other portions of the cap 1 beside the seal plug 5, namely the plug portion 4 and the cut-ring 21, are also made of same material as of the vessel 2.

In this case, the vessel can be collected and recycled more effectively because it is possible to omit extra work to remove the cap 1 including the

cut-ring 21 from the vessel 2.

The cap 1, the vessel 2 and the sleeve 6 are made of PET.

In this case, widespread vessels can be used. Further, its function to prevent oxidization of the filling in the receiving chamber can be improved.

EFFECT OF THE INVENTION

According to a cap relating to the present invention, it becomes possible to produce the plug portion or the seal plug without sever caring about accuracy in their shapes, and a raw material or the like contained in a receiving chamber can be sealed and preserved with high reliability at low cost.

According to a sealing mechanism of claim 2, because it is not needed to equip particular structure to be pressed tightly to or be caught by the inner surface of the opening portion, the shape of the sleeve can be simplified and an insertion to the opening portion can be easily done. Further, the seal plug can be separated with more high reliability.

According to the feature of claim 3, the cap relating to the present invention can be preferably used.

According to the feature of claim 4, the seal plug can be separated smoothly because stress is concentrated on specific one portion of it.

According to the features of claims 5 and 7, the vessel can be collected and recycled effectively.

According to the features of claims 6 and 8, widespread vessels can be used. Further, its function to prevent oxidization of the filling in the receiving chamber can be improved.